hairmax®
TRANSFORMATIVE HAIR REGROWTH

Clinical Synopsis & Summary

Hairmax® Laser Phototherapy Devices for the Treatment of Androgenetic Alopecia and the Promotion of Hair Growth in Men and Women

Last Updated March 2025

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Executive Summary

INTRODUCTION

The HairMax laser devices are home-use low level laser therapy (LLLT) devices that has been clinically proven and FDA Cleared to treat androgenetic alopecia and promote hair growth in men and women. Initial development of the HairMax LaserComb began in the 1980's in Sydney, Australia where our CEO, Henry Pearl pioneered the use of laser phototherapy in a clinical setting to activate hair growth. The results were dramatic with men and women experiencing substantial improvement in hair growth, hair regrowth and overall quality of hair. David Michaels joined Henry Pearl to start development of a home use laser system that was safe, efficacious and provided strong customer benefits. David and Henry moved to Boca Raton, Florida and formed Lexington International LLC. The HairMax was introduced in 2000 and has been chosen by over 1 million men and women around the world to re-grow their hair. The devices have also become part of the armamentarium of countless dermatologists as a first line non-drug option for treatment. Lexington is dedicated to the research and development of laser therapy and the treatment of hair loss with a strong emphasis on customer satisfaction.

INDICATIONS OF USE

HairMax Laser devices are indicated to treat Androgenetic Alopecia, and promote hair growth in males who have Norwood Hamilton Classifications of IIa to V and in females who have Ludwing (Savin) I-4, II-1, II-2, or frontal patterns of hair loss and who both have Fitzpatrick Skin Types I to IV.

The HairMax Laser 272 is indicated to promote hair growth in males with Androgenetic Alopecia who have Norwood-Hamilton Classifications of IIa - V, or females with androgenetic alopecia who have Ludwig-Savin Classifications I - II or Frontal and for both with Fitzpatrick Skin Phototypes I- IV.

FDA CLEARED, CLINICALLY PROVEN DEVICES

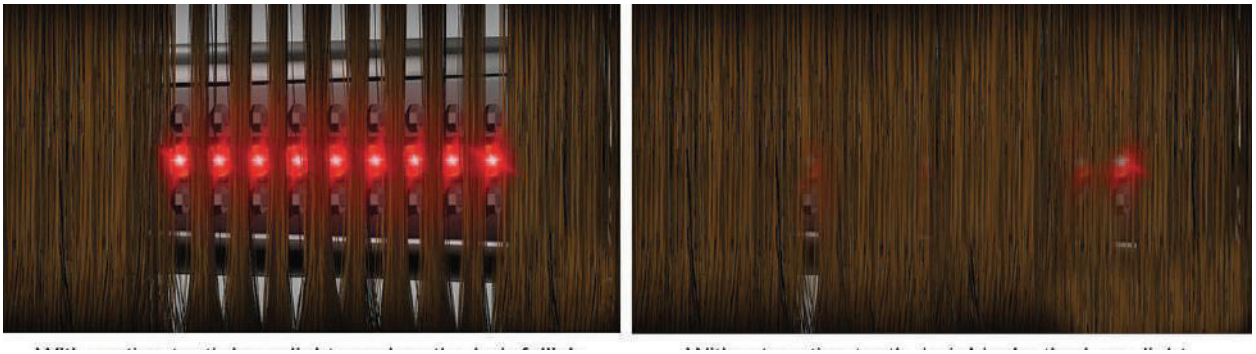
The HairMax laser devices are a family of home-use laser therapy medical devices. The HairMax Ultima 12 with 12 laser modules requires treatment time of 8 minutes, 3 times a week. The enhanced hands-free HairMax LaserBands 82 and 41 have 82 and 41 laser modules respectively, for treatment time of as little as 90 seconds for the LaserBand 82 and 3 minutes for the LaserBand 41, three times a week, which is the fastest treatment time of any device of its kind.

LASER SPECIFICATIONS

All HairMax laser devices are internationally classified as 3R laser products, safe for consumer use. Each laser module is 5mW at 655nm. Lexington fabricates each module using high grade medical diodes and specialized focused lenses to output a high concentration of laser speckles for maximum efficacy.

PATENTED HAIR PARTING TEETH

The laser treatment is only effective when the optimal amount of laser energy reaches the scalp. Since hair is a photo-protectant, it can block most of the laser energy from reaching the scalp. Therefore, the HairMax employs a hair parting teeth mechanism to plow and part the hair allowing an unobstructed path for the laser to reach the scalp. The hair parting teeth allow maximum laser delivery and maximum effectiveness.



BENEFITS

- New hair re-growth
- A substantial decrease in hair fallout.
- Helps reduce inflammation
- Better manageability of hair
- Overall better quality and condition of hair
- Helps normalize scalp conditions
- Consistent positive results demonstrated in both vertex and frontal regions

MONO, CONCOMITANT AND ADJUNCTIVE USE

- HairMax laser devices are clinically proven to be effective as mono therapy.
- HairMax laser devices can be used concomitantly with other modalities such as minoxidil or finasteride. Significant improvements in benefits have been reported when used in combination with other modalities.
- When used adjunctively, the HairMax LaserComb has been reported to decrease healing time and contribute to graft patency after hair transplant surgery.

There are no contraindications to use of the HairMax laser devices.

HAIRMAX® LASER DEVICES

Ultima 12	LaserBand 41	LaserBand 82	Laser 272 Cap
12 LASER MODULES	41 LASER MODULES	82 LASER MODULES	272 LASER MODULES
3x PER WEEK	3x PER WEEK	3x PER WEEK	3x PER WEEK
8 MINUTES	3 MINUTES	AS LITTLE AS 90 SECONDS	15 MINUTES

HairMax Laser Devices - Clinical Timeline

- **2001** – HairMax LaserComb introduced
- **2002** - Clinical evaluation conducted via independent research by Dr. Michael Markou (Florida) and published *in* ***International Journal of Cosmetic Surgery and Aesthetic Dermatology****,* a peer review medical journal.
- **2002** – IRB approved clinical study conducted by Dr. Roy Geronemus and Dr. Macrene Alexiades-Armenakas at the Laser and Skin Surgery Center of New York. Study involved 44 males and females and demonstrated that 97.2% of participants received some benefit in hair loss prevention and 81.9% experienced hair regrowth greater than 11%.
- **2005** - Multi-center, double blind, sham-device controlled clinical study proving efficacy of the HairMax LaserComb in males with androgenetic alopecia began.
- **2006** - Multi-center double blind, sham device controlled clinical study on efficacy and safety of the HairMax in females with androgenetic alopecia began.
- **2007** - HairMax LaserComb receives FDA 510(k) Marketing Clearance as an OTC (non-prescription) Class II medical device for the treatment of androgenetic alopecia and promotion of hair growth in males.
- **2008** – HairMax study conducted in Brazil by Dr. Maria Muricy to evaluate hair growth with the HairMax alone and in combination with minoxidil. Biopsies were obtained and the results of the study demonstrated a reversal of follicular apoptosis using BCL2 markers. Results were presented at 2008 Annual Meeting of the ISHRS.
- **2009** – Pilot study completed by Dr. Adyta Gupta, Canada on the efficacy of the HairMax in treating mild to moderate seborrheic dermatitis on 10 subjects. Results showed positive effect of the HairMax on the condition.
- **2009** – Ex-vivo study conducted by Bio-Ec, France to evaluate the effect of two laser doses and one reference dose on ex-vivo hair growth. Micro-dissected hair follicles were placed in Philpott medium and pre-cultured for 4 days. Laser energy was administered daily for 4 minutes/day for 10 days. Findings were that all laser devices induced increased hair growth elongation on day 3 of evaluation.
- **2009** - Multi center clinical study published in peer reviewed medical journal ***Clinical Drug Investigation*** Volume 29.

- **2009** - A cordless model of the HairMax LaserComb receives FDA Clearance and is introduced to market.

- **2010** – Alopecia Areata Study conducted at University of Miami evaluating effects of the HairMax LaserComb in 14 C3H/HeJ mice with localized alopecia areata from heat shock induction.

- **2009/2010** - Three additional clinical studies completed on males and females with androgenic alopecia. These studies provide further proof that the HairMax is safe and effective in promoting hair growth, reducing hair loss and treating androgenetic alopecia.

- **2011 –** Post-Chemotherapy Study conducted at University of Miami evaluating effects of the HairMax LaserComb to assess accelerated regrowth of hair in young rat model.

- **2011** – FDA Marketing Clearance granted for 3 new devices for the treatment of AGA in males.

- **2011** – FDA Marketing Clearance granted for the treatment of AGA in females.

- **2011** – Completion of clinical trial on the HairMax Dual Beam 12 for the treatment of AGA in females. FDA Clearance for Marketinggranted.

- **2011** – FDA Clearance for marketing granted for the HairMax Advanced 7 and the HairMax Professional 12 for the treatment of AGA infemales.

- **2011** - Clinical research program in AGA completed – All HairMax LaserComb models indicated for treating AGA and for promotion of hair growth in men and women

- **To date** - 460 subjects have been involved in seven clinical studies on the safety and efficacy of the HairMax.

- **2014** – Landmark clinical study with 4 LaserComb models and over 200 male and female subjects, published in the peer review journal, The American Journal of Clinical Practice April 2014, Volume 15, Issue 2, pp 115-127,

- **2015** – Introduction of the HairMax LaserBand 82- Provided enhanced hand free treatment device with 82 laser diodes that incorporates a patented hair parting teeth mechanism, to automatically part the hair during use to deliver the optimal laser energy to the scalp for delivery to the hair follicles. Treatment is for as little as 90 seconds, 3 times a week, the fastest treatment time of any device of its kind.

- **2016** – Introduction of the HairMax LaserBand 41 – Provides a cost-efficient enhanced treatment device with 41 laser modules that incorporates a patented hair parting teeth mechanism, to automatically part the hair during use to deliver the optimal laser energy to the scalp for delivery to the hair follicles. Treatment is for as little as 3 minutes, 3 times a week, the fastest treatment time of any device of its kind.

- **2018** – Introduction of the HairMax Laser 272 Cap – Incorporates 272 medical grade lasers in an exclusive Power*Flex* Design in a hands-free cap. Treatment time is 15 minutes, 3 times a week.

Safety Standards & Medical Device Certifications

- All HairMax laser devices, meets or exceed FDA Performance Standards for Laser Products, except for deviations pursuant to Laser Notice No. 50 as described by FDA-21 CFR-1040, and safety requirements of the International Laser Product Safety Standard IEC-60825

- HairMax devices are manufactured in an ISO, Good Manufacturing Practices (GMP) certified facility adhering to the quality requirements of ISO-13485:2016; a Medical Device Quality Management System Standard.

- Lexington International, LLC, the designer and legal manufacturer of HairMax devices is a medical device company, registered not only under ISO-13485:2016 but also under the most stringent medical device International regulatory framework, MDSAP (Medical Device Single Audit Program), with regular audit schedules and conformance in some of the main world markets: The US, Canada, Brazil and Australia. The MDSAP Certification No is: 0079595-00.

- CE Compliant for electrical safety to ISO60601-1 and ISO60601-1-2

- HairMax devices are registered as medical devices in the following countries:

    - United States FDA, No. 3006182775 with the following clearances: K060305, K093499, K110233, K103368, K112524, K111714,
    - Health Canada – Medical Device License No. 61237
    - Australia TGA – ARTG 162142 Class IIa, GMDN 47417
    - Brazil ANVISA – 25351.246282/2006-34
    - Korean MFDS (Ministry of Drug and Food Safety) – A37020(3), License No. 14487
    - Saudi Arabian Medical Device License - MDNR100608340001
    - Egypt – Ministry of Health
    - Singapore – Health Sciences Authority – MD11535930S
    - Russia – POCC US.AN29. A02083
    - Colombia – INVIMA No. 2012DM-0009190
    - Kuwait – Ministry of Health
    - Thailand – Thai FDA – 5501729
    - Israel – Ministry of Health
    - United Kingdom – ASA Acceptance of Efficacy Claims
    - Taiwan – FDA, Certificate No. DHA05602710106
    - Mexico – FDA - COFEPRIS, Registration No. 2109E2018 SSA

Overview of Androgenetic Alopecia

Male and female pattern hair loss is a common, chronic dermatologic disorder. Androgenetic Alopecia affects an estimated 50 million men and 30 million women in the United States with Male pattern hair loss (AGA) affecting 50%of men by 50 years of age. The frequency and severity of female pattern hair loss (FPHL) also increases with age, with a prevalence of over 50% in women over the age of 80 years and is also characterized with miniaturization. By age 40, approximately forty percent of men and women have visible symptoms of hereditary hair loss. By age 50, approximately 50 percent of both genders show signs of the condition.

MPHL is characterized by a dihydrotestosterone-dependent process with miniaturization of terminal hair follicles (HF's) into vellus HRs. The process of miniaturization is a gradual process brought on by androgenic hormones. Miniaturization leads to thinning, a decrease in density, and ultimately balding of the hair on the scalp. The goal of hair loss treatments is to increase hair coverage of the scalp and retard and reverse the miniaturization process. If thinning is minimal, the main perceived response may be retardation of further thinning[5].

The typical pattern of AGA in men begins at the hairline, the existing hair may become finer and shorter. The hair at the crown also begins to thin, and eventually the top of the hairline meets the thinned crown, leaving a pattern of hair around the sides of the head.

The typical pattern of AGA in women is different from that in men. AGA in women causes diffuse thinning of the hair at and behind the hairline with thinning all over the head. There may be moderate loss of hair on the crown, but this rarely progresses to total or near baldness as it may in men.[3]

Genetic predisposition to hereditary hair loss can be inherited from either side of a person's family or from both parents. It is found in men and women of virtually all races and ethnicities. Hair loss is a common and distressing condition. Americans spend about one billion dollars annually for treatments to combat and cover up hair loss.[1,2]

The HairMax Laser Devices and Androgenetic Alopecia

Most men and women with androgenetic alopecia (AGA) are concerned enough about their hair loss to seek remedies to regrow their hair. Although there are surgical options available, many patients would rather use non-surgical procedures to effect change. While there is a plethora of products available that claim efficacy in treating hair loss, the majority of them do not have any scientific proof as to the value of their claims. In fact, there are only two medicinal products/ingredients with proof of efficacy and FDA approval for use in promoting hair growth, minoxidil and finasteride. Finasteride is only indicated for the treatment of AGA in males, leaving minoxidil as the only drug proven useful in treating AGA in females. Since hair loss is a cosmetic problem in generally healthy individuals, treatment options should have little if any side effects from use. With the clearance of the HairMax LaserComb in 2007, an effective non-drug alternative became available for stimulating hair growth in those with AGA.

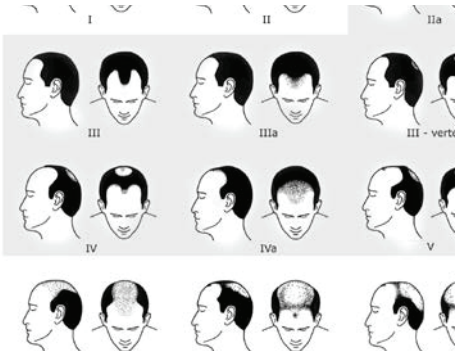
The HairMax laser devices also have an excellent safety profile, with only minor side effects reported in the ten years the device has been on the market. The HairMax laser devices offer an effective alternative to minoxidil for the treatment of females with AGA. In the seminal clinical paper, it was observed that “short term results of clinical studies with finasteride and minoxidil were comparable to the results found in the clinical studies with the HairMax laser devices.

EFFECTIVENESS

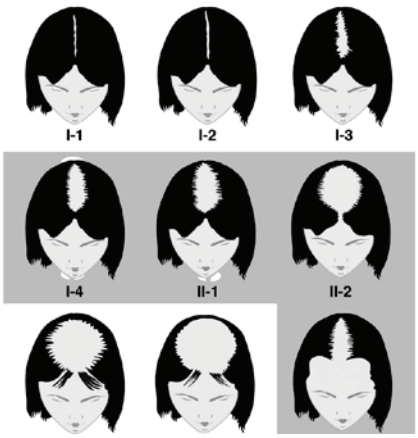
Studies involving 460 subjects demonstrate that the HairMax laser devices are an effective treatment for hair loss in men and women with certain classes of AGA. Subjects in the clinical studies demonstrated increases in hair counts on an average of 19 to 22 hairs per centimeter^2. The HairMax laser devices are indicated for the promotion of hair growth in males with Norwood Hamilton hair loss classifications of IIa to V and females with Ludwig (Savin) I-4, II-1, II-2, or frontal. Subjects in the clinical studies were limited to Fitzpatrick Skin Types I-IV (in order to facilitate hair counting methods as it is difficult to count a dark hair on darker skin tones). Field experience that significant benefits in all Fitzpatrick skin types can occur.

The HairMax laser devices have been clinically proven to be effective in men with the Norwood Hamilton Classifications and in females with the Ludwig (Savin) Classifications represented by the shaded classes in the pictures on the next page:

Norwood Hamilton Classification



Ludwig (Savin) Classification



Response to the HairMax laser devices varies, but generally those using the HairMax will start to see results in 12 weeks. In clinical studies over 90% of subjects on the HairMax devices experienced hair growth. The HairMax must be used continuously or hair will revert to the stage it was in prior to treatment.

Since the HairMax las devices are an anagen inductor, many patients will experience synchronized shedding of the miniaturized telogen hairs in the beginning stages of treatment. This shedding is only temporary and is an indication that the HairMax is beginning to exert its effect.

Hypothesized Mechanisms of Action

The HairMax laser devices are proven to stimulate hair regrowth for individuals with androgenetic alopecia.

The HairMax laser devices are hypothesized to be an anagen inductor by reducing inflammation, increasing vascularization and promoting the production of ATP, which in turn increases cellular metabolism, cellular activity and reduces oxidative stress. The hair follicle now has the building blocks and energy to transform a weakened follicle to one that is healthy. The enhanced environment then in turn invigorates the hair follicle which promotes hair growth and normalizes scalp conditions.

The following theories of the mechanisms of action of LLLT have been published.

ANAGEN INDUCTION HYPOTHESIS VIA BULGE ACTIVATION

Utilizing the mechanism of action of Photo-Bio Stimulation (LLLT) by furthering activation of the bulge-localization stem cell population by follicular papilla. The bulge activation hypothesis states that the initial event of anagen is the direct activation of a bulge-localized stem cell population by follicular papilla signaling. The resultant proliferation of bulge cells is the source of all hair follicle layers and of both the downward growth of the hair follicle and the upward growth of the hair shaft and inner rootsheath.

EFFECTS ON ATP SYNTHESIS

Absorption of photons by cytochrome C oxidase (COX) molecules leads to stimulated state and consequently can lead to acceleration of transfer reactions. LLLT is hypothesized to release nitric oxide (NO) bound to COX receptors which allows the progression of the respiratory chain, leading to increased production of ATP. Increases in ATP synthesis and increases in proton gradient lead to an increasing activity of the Na+/H+ and Ca_2/Ns+antiporters and of all the ATP driven carriers for ions, such as Ns+/K ATPase and Ca^{2+} pumps[8].

PROLIFERATION OF CELLS OF THE FOLLICULAR EPITHELIAL MATRIX

The analysis of biopsies using Ki67 and Beta Catenin markers show evidence that LLLT interacts with the cells of the epithelial matrix causing multiplication of those cells responsible for hair growth. Alternately, LLLT may stimulate the derma papilla which in turn stimulates cell proliferation of the matrix cells (indirect stimulation). Increased telogen shedding at the onset of treatment may be evidence of this process occurring.

REDUCTION OF INFLAMMATION

Biopsy examination has demonstrated a reduction in follicular inflammation following the application of LLLT.

FOLLICULAR APOPTOSIS

Significant apoptosis occurs when follicles are in catagen and they are committed to exit anagen. It is hypothesized that LLLT delays catagen onset, thus extending the growth phase of the cycle (anagen). Studies using BCL-2 and PTEN markers support this hypothesis. Delaying catagen would allow hairs to grow longer and reduce miniaturized hair.

INCREASED VASCULARIZATION

Confocal microscopic evidence that vellus follicles were described as “being surrounded by a very simple capillary system whereas resting follicles are surrounded by a palisade of capillaries

connected by short, transverse vessels"[6] provides further evidence that increasing blood circulation to vellus follicles may directly correlate with anagen induction in AGA.

LLLT can release NO bound to hemoglobin resulting in vasodilation around the localized hair follicle.

OXIDATIVE CHANGES

LLLT has been reported to produce a shift in overall cell redox potential, regulating reactive oxidation species and super oxides resulting in a reduction of oxidative stress.[9,10]

REVERSES MINIATURIZATION

The HairMax laser devices have been proven by macro photography to reverse the process of miniaturization.

Published Clinical Studies on Efficacy and Safety

The efficacy and safety of the HairMax in the treatment of androgenetic alopecia (AGA) in males and females has been demonstrated in seven clinical trials involving 460 subjects. Further, the excellent safety profile has been proven in these studies and there has never been a report of serious adverse effects occurring.

The results of 5 clinical studies have been published in peer review journals. The results of 3 of these clinical studies are described from the articles cited below:

I. **April 2014** - The American Journal of Clinical Dermatology, a peer reviewed article was published entitled: **Efficacy and Safety of a Low-level Laser Device in the Treatment of Male and Female Pattern Hair Loss: A Multicenter, Randomized, Sham Device-controlled, Double-blind Study** Joaquin J. Jimenez , Tongyu C. Wikramanayake, Wilma Bergfeld, Maria Hordinsky,Janet G. Hickman, Michael R. Hamblin and Lawrence A. Schachner
[Am J Clin Dermatol. 2014 Apr;15(2):115-27]

OBJECTIVE

To determine whether treatment with a low-level laser device, the US FDA-cleared HairMax LaserComb®, increases terminal hair density in both men and women with pattern hair loss. A video discussion of the results of these studies by the senior author of the clinical paper athttp://www.hairmaxpro.com/study-html/.

METHODS

Randomized, sham device-controlled, double-blind clinical trials were conducted at multiple institutional and private practices. A total of 146 male and 188 female subjects with pattern hair loss were screened. A total of 128 male and 141 female subjects were randomized to receive either a LaserComb (one of three models) or a sham device in concealed sealed packets and were treated on the whole scalp three times a week for 26 weeks. Terminal hair density of the target area was evaluated at baseline and at 16- and 26-week follow-ups and analyzed to determine whether the hypothesis formulated prior to data collection, that LaserComb treatment would increase terminal hair density, was correct. The site investigators and the subjects remained blinded to the type of device they dispensed/received throughout the study. The evaluator of masked digital photographs was blinded to which trial arm the subject belonged.

RESULTS

Seventy-eight, 63, 49, and 79 subjects were randomized in four trials of 9-beam LaserComb treatment in female subjects, 12-beam LaserComb treatment in female subjects, 7-beam LaserComb treatment in male subjects, and 9- and 12-beam LaserComb treatment in male subjects, compared with the sham device, respectively. Nineteen female and 25 male subjects were lost to follow-up. Among the remaining 122 female and 103 male subjects in the efficacy analysis, the mean terminal hair count at 26 weeks increased from baseline by 20.2, 20.6, 18.4, 20.9, and 25.7 per cm^2 in 9-beam LaserComb-treated female subjects, 12-beam LaserComb-treated female subjects, 7- beam LaserComb-treated male subjects, and 9- and 12-beam LaserComb-treated male subjects, respectively, compared with 2.8 ($p < 0.0001$), 3.0 ($p < 0.0001$), 1.6

(p = 0.0017), 9.4 (p = 0.0249), and 9.4 (p = 0.0028) in sham-treated subjects (95 % confidence interval). The increase in terminal hair density was independent of the age and sex of the subject and the LaserComb model. Additionally, a higher percentage of LaserComb-treated subjects reported overall improvement of hair loss condition and thickness and fullness of hair in self-assessment, compared with sham-treated subjects. No serious adverse events were reported in any subject receiving the LaserComb in any of the four trials.

CONCLUSIONS AND RELEVANCE

"We observed a statistically significant difference in the increase in terminal hair density between LaserComb - and sham-treated subjects. No serious adverse events were reported. Our results suggest that low-level laser treatment may be an effective option to treat pattern hair loss in both men and women. Additional studies should be considered to determine the long-term effects of low-level laser treatment on hair growth and maintenance, and to optimize laser modality".

Before and after global photographs (Fig. 3a, b) and macrophotographs (Fig. 3c, d) demonstrated increases in terminal hair density, most likely through the conversion of vellus or intermediate follicles to terminal follicles or from resting telogen follicles to active anagen follicles.

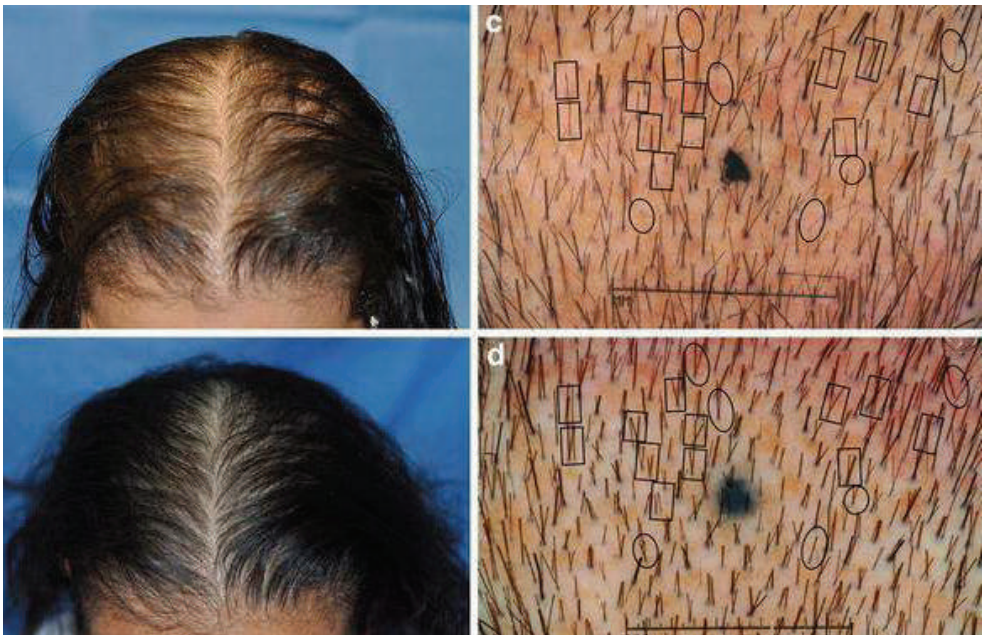


Fig. 3
Male and female pattern hair loss before and after LaserComb treatment. Global photographs of a female subject, at baseline (**a**) and after 26 weeks (**b**) of the 12-beam LaserComb treatment. Macrophotographs of a male subject, at baseline (**c**) and after 26 weeks (**d**) of the 9-beam LaserComb treatment. **Increased hair count through conversion of vellus or intermediate follicles to active follicles producing terminal hair (*ovals*) or resting telogen to active anagen follicles (*rectangles*) is highlighted**

Below are the results of a retrospective study published in the peer review journal cited.

11.April 2014 -The International Journal of Trichology, entitled: **Use of Low-Level Laser Therapy as Monotherapy or Concomitant Therapy for Male and Female Androgenetic Alopecia**

Andréia Munck, Maria Fernanda Gavazzoni, Ralph Trüeb

Int J Trichology. 2014 Apr;6(2):45-9

OBJECTIVE

The aim was to evaluate the efficacy and safety of low-level therapy (LLLT) for AGA, either as monotherapy or as concomitant therapy with minoxidil or finasteride, in an office-based setting.

MATERIALS AND METHODS

Retrospective observational study of male and female patients with AGA treated with the 655 nm - HairMax LaserComb, in an office-based setting. Efficacy was assessed with global photographic imaging.

RESULTS

Of 32 patients (21 female, 11 male), 8 showed significant, 20 moderate, and 4 no improvement. Improvement was seen both with monotherapy and with concomitant therapy. Improvement was observed as early as 3 months and was sustained up to a maximum observation time of 24 months. No adverse reactions were reported.

CONCLUSIONS:

LLLT represents a potentially effective treatment for both male and female AGA, either as monotherapy or concomitant therapy. Combinations treatments with minoxidil, finasteride, and LLLT may act synergistically to enhance hair growth.

NOTES

Patients had to have had at least 9 months treatment with drugs, and 26 were not responding well so the HairMax LaserComb was added to the drug treatment regimen. The balance of 6 patients were intolerant to drug therapy, so the drugs were discontinued and the HairMax LaserComb was used alone.

The results of the analysis after 3 months showed that 88% of all patients who were responding poorly or intolerant of drug therapy and had the HairMax LaserComb added to the regimen, demonstrated significant improvement. Of equal importance, 100% of patients treated with the HairMax LaserComb alone, showed significant improvement. (These global results correlate with hair count results found in all other published HairMax LaserComb clinical studies).

PHOTOGRAPHY

Below are pictures showing the effects of the addition or substitution of the HairMax LaserComb to treatment regimens.

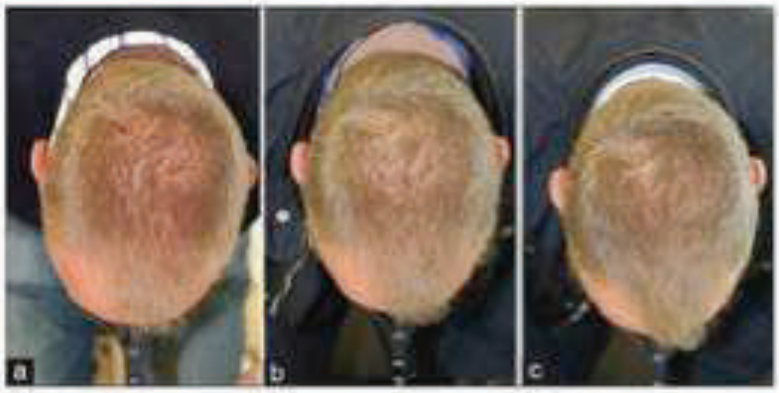


Figure 1: Monotherapy in a 54-year-old male (a) Before treatment, and improvement after (b) 6 months, and (c) 12 months of low-level laser therapy

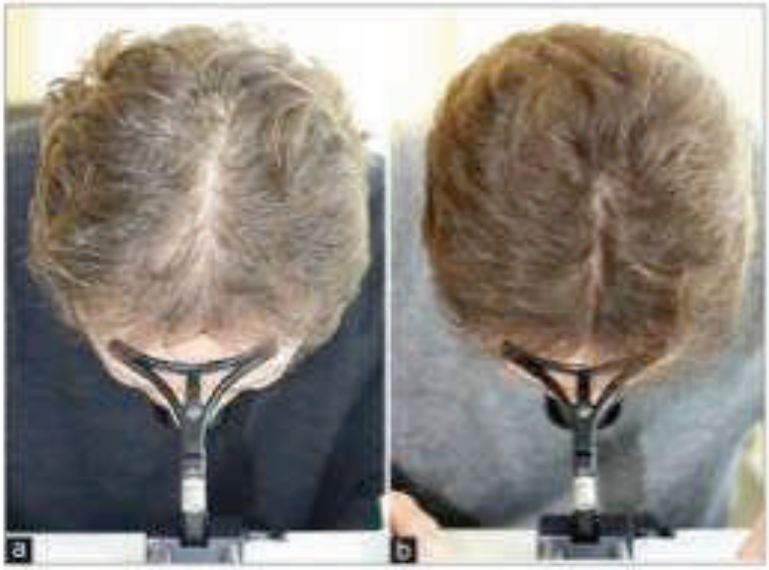


Figure 2: Concomitant treatment with topical 5% minoxidil in a 55-year-old male adding on low-level laser therapy (LLLT) to 4 year pretreatment with 5% topical minoxidil solution (a) Before, and (b) After 3 months of added LLLT

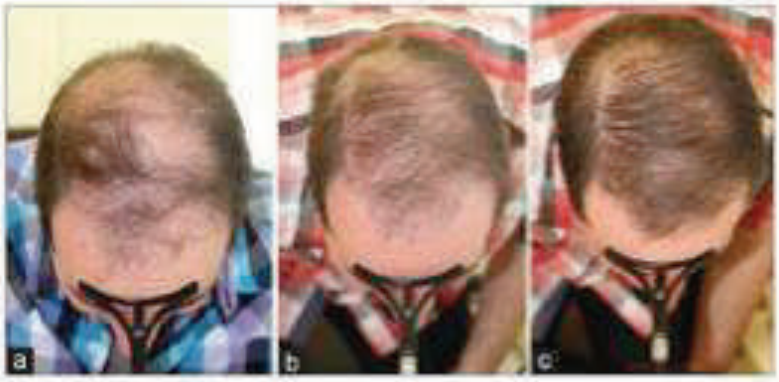


Figure 3: Concomitant treatment with topical 5% minoxidil and 1 mg oral finasteride in a 34-year-old male (a) Before, (b) After 9 months treatment with 1 mg oral finasteride and topical 5% minoxidil solution bid, and (c) After 3 months after adding on low-level laser therapy

IV. May 2009 -. This article described the clinical results of a trial which led to the first FDA Clearance of the HairMax LaserComb for treatment of AGA in males was published in in the peer review journal, Clinical Drug Investigation, entitled, **HairMax LaserComb Laser Phototherapy Device in the Treatment of Male Androgenetic Alopecia, A Randomized, Double-Blind, Sham Device-Controlled, Multicenter Trial**

Leavitt M, Charles G, Heyman E, Michaels D
Clin Drug Investig. 2009;29(5):283-92

OBJECTIVE

To assess the safety and effectiveness of the HairMax LaserComb laser phototherapy device in the promotion of hair growth and in the cessation of hair loss in males diagnosed with androgenetic alopecia (AGA).

MATERIALS AND METHODS

The double-blind, sham device-controlled, multicenter, 26-week trial randomized male patients with Norwood-Hamilton classes IIa-V AGA to treatment with the HairMax LaserComb or the sham device (2:1). The sham device used in the study was identical to the active device except that the laser light was replaced by a non-active incandescent light source.

RESULTS

Of the 110 patients who completed the study, subjects in the HairMax LaserComb treatment group exhibited a significantly greater increase in mean terminal hair density than subjects in the sham device group ($p<0.0001$). Consistent with this evidence for primary effectiveness, significant improvements in overall hair regrowth were demonstrated in terms of patients' subjective assessment ($p<0.015$) at 26 weeks over baseline. The HairMax LaserComb was well tolerated with no serious adverse events reported and no statistical difference in adverse effects between the study groups.

CONCLUSIONS

The current study has accomplished an important goal. This is the first study demonstrating efficacy in hair growth with a laser phototherapy device, the HairMax LaserComb.

SUMMATION OF HAIR COUNT CHANGES FROM ALL CLINICAL STUDIES CONDUCTED TO DATE

2003 STUDY - MALES AND FEMALES

Investigators - Roy Geronemus, MD, Macrene Alexiades-Armenakas, MD

	Treatment Area	
Summary	Frontal	Vertex
Number of Subjects	26	50
Week 16 Mean Change(SD)hairs/cm² % change	26.1 (25.9) 38.4%	28.6 (29.8) 31.0%
P-value	<0.0001	<0.0001
Week 26 Mean Change(SD)hairs/cm² % change	37.9 (34.8) 54.6%	43.0 (30.7) 48.1%
P-value	<0.0001	<0.0001

Results: **97.7% of study participants showed successful benefits with an average hair count increase of 37.9 hairs/cm² (frontal) and 43.0 hairs/cm² (vertex) at 26 Weeks.**

2005 STUDY - MALES

Investigators- Irwin Kantor, MD, Elyse Rafal, MD, Harlan Bieley, MD, Toni Funicella, MD

	Hair Max LaserComb Number of Subjects = 72	**Placebo Number of Subjects =40**
Baseline – Hair Counts		
Mean (SD) hairs/cm²	124.1 (52.1)	124.7 (54.3)
Range hairs/cm²	21.6, 252.1	25.5, 281.4
Change from baseline		
Mean (SD) hairs/cm²	16.3 (14.6)	-12.3 (24.5)
Range hairs/cm²	-56.0, 52.2	-145.1, 7.6
Adjusted mean hairs/cm²	18.8	-10.6
P-Value	<0.0001	

Results: **84.2% of study participants showed successful new hair growth with an average hair count increase of 18.8 hairs/ cm² at 26 Weeks.**

2005 STUDY - FEMALES

Investigators – Marco Barusco, MD, Toni Funicella, MD, Daniel Rowe, MD, Irwin Kantor, MD, Elyse Rafal, MD

	Hair Max LaserComb® Number of Subjects = 29	**Placebo Number of Subjects = 20**
Baseline – Hair Counts		
Mean Change(SD)hairs/cm²	128.6 (SD) 31.7	130.6 (SD) 39.1
Range hairs/cm²	44.6, 183.3	38.2,192.3
Change from baseline		
Mean Change SD hairs/cm²	18.6 (SD) 12.4)	-4.9 (SD) 8.5
Range hairs/cm²	-1.3, 44.6	-20.4, 10.2
Adj. mean change hairs/cm²	18.5	-6.0
P-Value	<0.0001	

Results: 93.1% of study participants showed successful new hair growth with an average hair count increase of 18.5 hairs/ cm² at 26 Weeks

2009-2010 STUDY - MALES 7 BEAM

Investigators– Michael Jarrett, MD, Abe Marcadis, MD

Terminal Hair Count Change from Baseline Summary

	Treatment	
Summary	LaserComb 7	Control
Week 16		
Subjects Completing	24	14
Mean Change (SD) hairs/cm²	**17.7 (12.83)**	**2.8 (6.89)**
Median hairs/cm²	17.8	3.2
Min, Max hairs/cm²	-16.6, 49.7	-15.3, 11.5
P-value	0.0019	
Week 26		
Subjects Completing	24	14
Mean Change (SD) hairs/cm²	**18.4 (13.78)**	**1.6 (8.60)**
Median hairs/cm²	16.6	3.2
Min, Max hairs/cm²	-5.1, 48.4	-16.6, 16.6
P-value	0.0017	

Results: 91.7% of study participants showed successful new hair growth with an average hair count increase of 18.4 hairs/cm² at 26 Weeks.

2009-2010 STUDY - MALES 9 & 12 BEAM

Investigators - Zoe Draelos, MD, David Goldberg, MD, Abe Marcadis, MD

Terminal Hair Count Change from Baseline Summary

	Treatment		
	LaserComb 9	LaserComb 12	Control
Baseline Mean (SD) Hair Count	163.3 (69.35)	151.5 (42.37)	171.4 (62.30)
Week 16 Subjects Completing **Mean Change (SD) hairs/cm²** Median hairs/cm² Min, Max hairs/cm²	 21 **20.4 (14.52)** 19.1 -1.3, 57.3	 22 **23.5 (17.67)** 21.0 -5.1, 56.0	 22 **4.4 (8.38)** 4.5 -7.6, 31.8
P-value	0.0007	0.0002	
Week 26 Subjects Completing **Mean Change (SD) hairs/cm²** Median hairs/cm² Min, Max hairs/cm²	 21 **20.9 (14.08)** 17.8 2.5, 57.3	 22 **25.7 (16.92)** 25.5 -3.8, 56.0	 22 **9.4 (12.94)** 5.7 -3.8, 53.5
P-value	0.0249	0.0028	

Results: 95% of study subjects demonstrated new hair growth with an average hair count increase of 20.9 and 25.7 hairs/cm² for 9 & 12 beam devices respectively –Wk. 26

2009-2010 STUDY FEMALES 9 BEAM

Investigators – Janet Hickman, MD, David Goldberg, MD, Michael Jarrett, MD, Abe Marcadis, MD, Jose Mendez, DO

Observed Terminal Hair Count Change from Baseline Summary

Summary	Treatment	
	LaserComb 9	Control
Baseline		
Mean (SD) Hair Count	162.6 (46.17)	155.7 (43.51)
Week 16		
Subjects Completing	43	22
Mean Change (SD) hairs/cm²	**14.8 (9.70)**	**1.3 (14.67)**
Median hairs/cm²	12.7	1.3
Min, Max hairs/cm²	0.0, 47.1	-16.6, 59.8
P-value[1]	<.0001	
Week 26		
Subjects Completing	42	21
Mean Change (SD) hairs/cm²	**20.5 (11.11)**	**2.7 (16.88)**
Median hairs/cm²	17.8	0.0
Min, Max hairs/cm²	2.5, 48.4	-14.0, 67.5
P-value	<.0001	

Results: 95.2% of study participants showed successful new hair growth with an average hair count increase of 20.5 hairs/cm^2 at 26 Weeks.

2010 STUDY – FEMALES DUAL 12 BEAM

Investigators - Wilma Bergfeld MD, Lawrence Schachner MD, Maria Hordinsky MD.

Observed Terminal Hair Count Change from Baseline Summary

Summary	Treatment	
	LaserComb 12	Control
Baseline		
Mean (SD) Hair count	162.6 (46.17)	155.7 (43.51)
Week 16		
Subjects Completing	39	18
Mean Change (SD) hairs/cm²	**11.9 (11.40)**	**-0.8 (7.87)**
Median hairs/cm²	11.5	0.0
Min, Max hairs/cm²	-5.1, 57.3	-14.0, 11.5
P-value [1]	0.0002	
Week 26		
Subjects Completing	39	18
Mean Change (SD) hairs/cm²	**20.6 (11.55)**	**3.0 (9.33)**
Median hairs/cm²	17.8	2.5
Min, Max hairs/cm²	0.0, 68.8	-8.9, 26.7
P-value [1]	<.0001	

Results: 94.8% of study participants showed successful new hair growth with an average hair count increase of 20.6 hairs/cm² at 26 Weeks.

Other Clinical Studies

SEBORRHEIC DERMATITIS

HairMax LaserComb Open Label Pilot Study to Treat Seborrheic Dermatitis – Aditya Gupta, M.D., Ph.D. - Data on File

Objective: To test whether the stimulation of vascularization and cellular metabolism on the scalp by use of the HairMax LaserComb would produce improvement in the condition of scalp seborrheic dermatitis.

Methods: LaserComb used 3 times weekly on non-consecutive days. GOS measurement of 0, 1 or 2 at week 12.

Results: Of 9 patients completing the trial and receiving a GOS (Global Outcome Score)

- 60% (6) markedly or moderately improved
- 20% (2) slightly improved
- 1 unchanged.

Secondarily, all subjects demonstrated a TDSS (Total Dandruff Sum Score) reduction at week 12 compared to baseline.

Treatment of Androgenic Alopecia utilizing HairMax Laser Devices and Platelet Rich Plasma as Concomitant Therapy

It is thought by many dermatology practitioners that the results of treatment of androgenetic alopecia can be enhanced by using multimodality therapy combining PRP and LLLT. While there have been no formal clinical studies on the efficacy of this combinational approach, many dermatologists and hair transplantation specialists routinely utilize a combined treatment with PRP and HairMax laser devices (as described below), to enhance treatment outcome. HairMax Laser Devices have become the 'reference resource" on the efficacy of LLLT devices, due to the extensive body of evidence from 7 clinical studies that the devices are conclusively proven effective and safe for the treatment of AGA. (Am J Clin Dermatol. 2014 Apr;15(2):115-27).

PRP treatment and HairMax laser devices combinational treatment hypothesis.

Platelet-rich plasma (PRP) - Activated PRP is believed to affect hair cycling by prolonging the length of the anagen phase and preventing apoptosis and the catagen phase.

The mechanism for this affect is the hypothesis that PRP to **induces the proliferation of dermal papilla (DP) cells** by activating extracellular signal-related kinase (ERK) and protein kinase B (Akt, an anti-apoptotic signaling molecule) signaling (Alves and Grimalt, 2018, Cervelli et al., 2014, Li et al., 2012b). EGF and PDGF in PRP upregulate the ERK pathway, leading to the increased transcription of genes involved in cellular proliferation and differentiation. In addition, the increased expression of B-cell lymphoma-2 (an anti-apoptotic protein) has been observed in in vitro human DP cells cultured with PRP (Int J Womens Dermatol. 2019 Feb; 5(1): 46–51).

HairMax Laser Devices - Laser phototherapy is believed to stimulate anagen re-entry in telogen hair follicles, prolong duration of anagen phase, increase rates of proliferation in active anagen hair follicles and to prevent premature catagen development.

While the exact mechanism of action of LLLT in hair growth is not known, several mechanisms have been proposed. Evidence suggests that **LLLT acts on the mitochondria and may alter cell metabolism through photodissociation of inhibitory nitric oxide (NO) from cytochrome *c* oxidase (CCO)** (Unit IV in the respiratory chain of mitochondria), causing increased ATP production, modulation of reactive oxygen species, and induction of transcription factors such as nuclear factor kappa B, and hypoxia-inducible factor-1 Another consideration is **that inflammatory infiltrates are highly disruptive to hair follicle biology** and multiple cytokines such as IFN-γ, IL-1α and β, TNF-α, MHC and Fas-antigen and macrophage migration inhibitory factor are all involved in the cyclic hair growth and have been shown to play a role in the pathogenesis of AGA, **modulatory effects of LLLT on inflammation might have a significant role in treatment.** (https://doi.org/10.1002/lsm.22170)

As can be seen from the hypothesized mechanism of action of both modalities, choosing to use both in a combined approach when treating AGA is thought to result in a synergy, since each modality exerts its effect through a different mechanism of action to increase the duration of the anagen phase while helping to prevent apoptosis.

Mechanistic Studies - Completed

I. EVALUATION OF ACTIVITY OF LASER DOSES ON EX-VIVO HAIR GROWTH- Data on file.

Objective: To compare 2 laser doses and 1 reference dose on ex-vivo hair growth.

Methods: Micro-dissected hair follicles were isolated and placed in 48-well plates and maintained in Philpott hair culture medium. Follicles were pre-cultured for 4 days and cultured for additional 10 days. Laser energy administered daily for 4 minutes/day.

Results: All laser devices induced increased hair growth elongation on day 3 of hair fiber measurement. One laser device induced statistically significant

II. EFFECTS OF THE LEXINGTON LASERCOMB ON HAIR REGROWTH IN THE C3H/HeJ MOUSE MODEL OF ALOPECIA AREATA

Lasers Med Sci. 2011 Jul 9:953-7 – Conducted at University of Miami

Objective: To ascertain the effect of the LaserComb on hair regrowth in a mouse model of alopecia areata.

Methods: Fourteen 8-month female C3H/HeJ mice had AA induced by heat treatment. Histology from skin biopsies were confirmed in two mice. The remaining twelve mice were randomized into two groups:

Group 1 was treated with the HairMax LaserComb for 20 s daily, three times per week for a total of 6 weeks; group II was treated similarly, but with the laser off (sham-treated). Skin samples were collected from the dorsum of the mice and fixed in 10% formalin. Paraffin embedded section (5μm) were stained with hematoxylin and eosin (H&E) and evaluated under a microscope.

Results: After 6 weeks of the LaserComb treatment (group 1), an increase in the number of hair follicles was observed in the subcutaneous layer, the majority of which were in the anagen phase, though some had entered the catagen phase. The anagen hair bulbs were larger compared to the sham-treated mice (group II in whom the majority of the hair follicles were in telogen. In the sham-treated mice in group II after 6 weeks, the disruption of normal hair growth was apparent in the form of follicles without hair shafts, and the majority of the follicles were in the telogen phase, with the entire hair follicles located in the dermis. The sham-treated skin demonstrated reduced skin thickness and significantly reduced number of hair follicles.

Fig. 1 Effects of the Lexington HairMax LaserComb on hair regrowth in C3H/HeJ mice with alopecia areata. Shown are C3H/ HeJ mice with heat-induced alopecia before (a) and after 2 weeks (b) or 6 weeks (c) of laser treatment.

Conclusion: Using a mouse model with hair loss previously shown to mimic AA both clinically and histologically, marked hair regrowth was observed in the LaserComb treated mice compared with sham-treated mice. While hair regrowth was first observed 2 weeks later, the follicles were either still in anagen or in catagen, indicating that there is a much longer growth phase.

III. EFFECTS OF THE HAIRMAX LASERCOMB ON POST-CHEMOTHERAPY INDUCED ALOPECIA IN YOUNG RAT MODEL

Lasers Med Sci. 2012 Jun 14, 2012. Conducted at University of Miami.

Objective: To ascertain if the HairMax LaserComb accelerated regrowth of hair in an animal model of Post-Chemotherapy Alopecia (PCA).

Methods: A young rat model of CIA was used and administered per the following groups: group1, either cyclophosphamide, group 2, etoposide, and a group 3 a combination of cyclophosphamide and doxorubicin. Rats were randomized into three groups, one receiving chemotherapy, the other received immediate treatment with the HairMax LaserComb daily for 10 days, turned off and the third was treated with the LaserComb turned on. Seven to ten days later, full body alopecia was observed in all groups.

Results: The group receiving treatment with the HairMax LaserComb regrew the hair 5 days earlier than the untreated and sham groups.

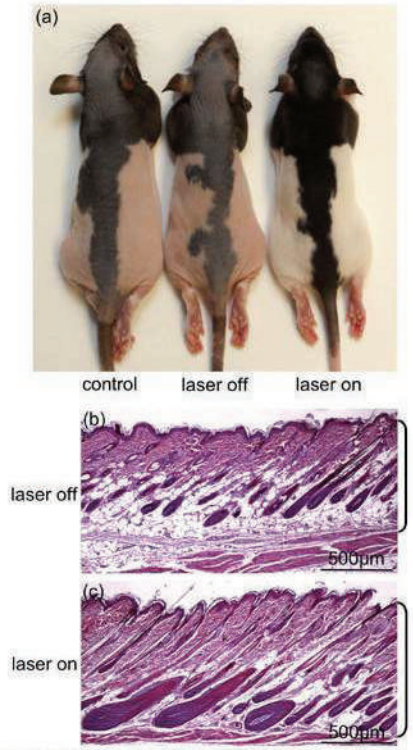


Figure 1. Effects of the HairMax LaserComb treatment on hair regrowth in rats after chemotherapy-induced alopecia. (a) Representative rats treated with cyclophosphamide chemotherapy alone (contro, Group 1l), chemotherapy and sham LaserComb treatment (with the laser turned off, Group 3) and chemotherapy and LaserComb treatment (laser on, Group 2) 15 days after chemotherapy. Notice the regrown hair coat in rat with laser on, while the other two rats remain alopecic. (b, c) Histology of dorsal skin biopsies from rats 15 days after treatment with cyclophosphamide and the HairMax LaserComb, with the laser turned off

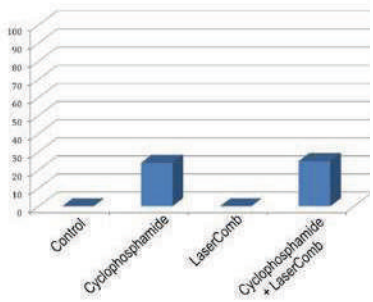


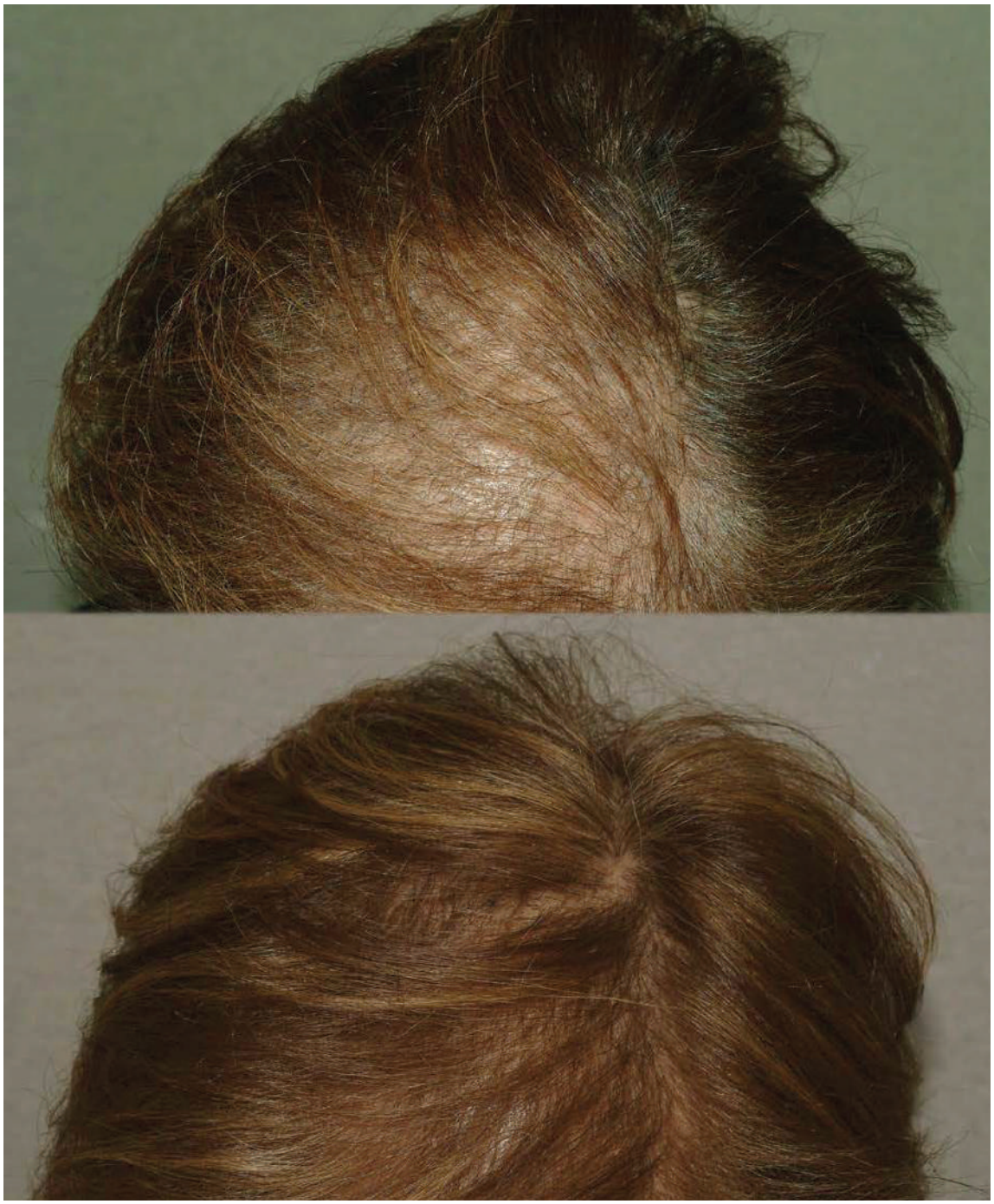
Figure 2. Percentage of leukemia-free rats at 25 days after Shay chloroleukemia cell injection, with or without cyclophosphamide chemotherapy or HairMax LaserComb treatment.

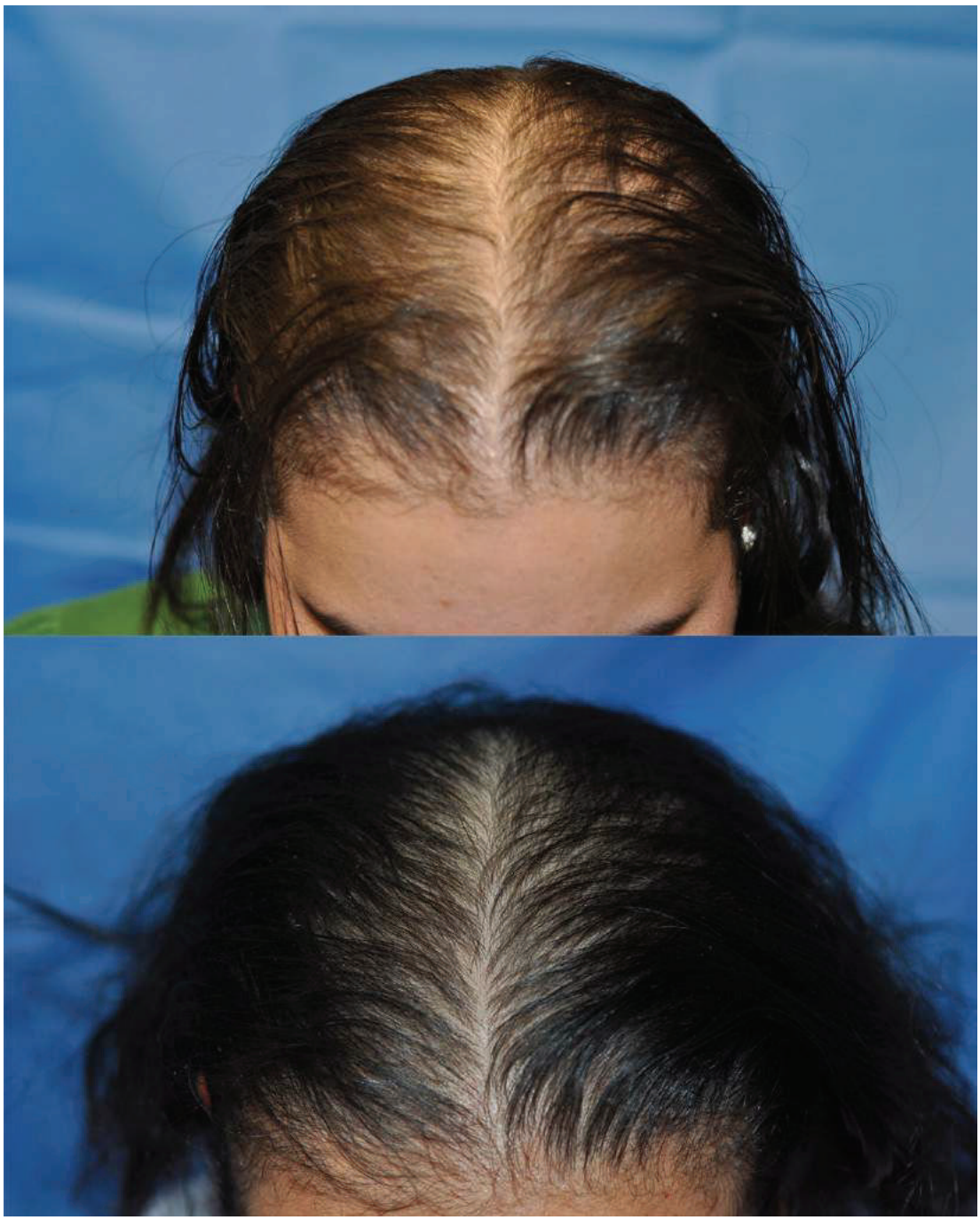
Conclusion: Treatment with the HairMax LaserComb may provide a means of accelerating hair growth in PCA. Our results should be extrapolated to the treatment of PCA because the HairMax LaserComb provides a user friendly and non-invasive approach which could be translated to increased patient compliance and improved efficacy.

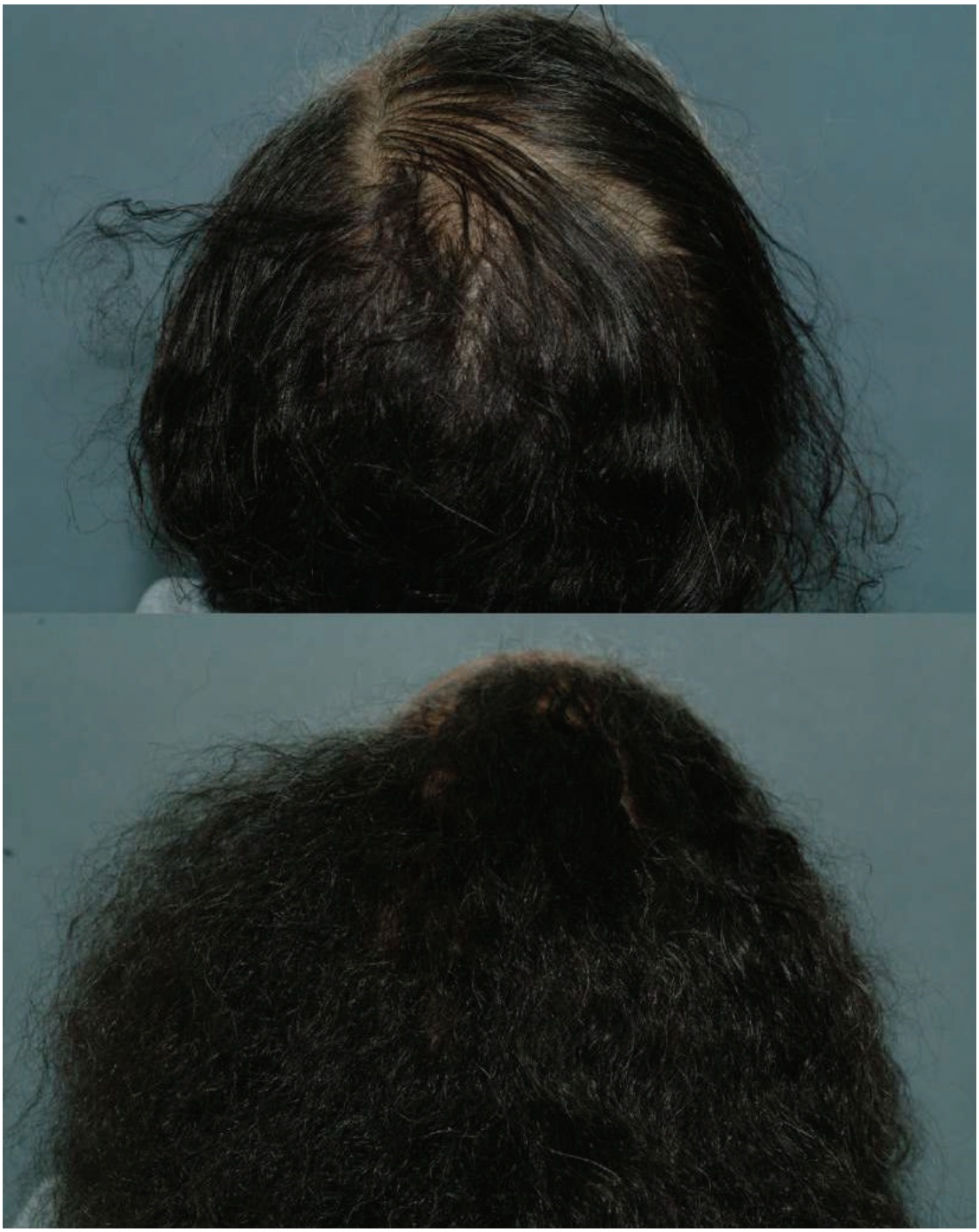
Clinical Research Projects

Clinical studies on the application of light for other disease states is being investigated.

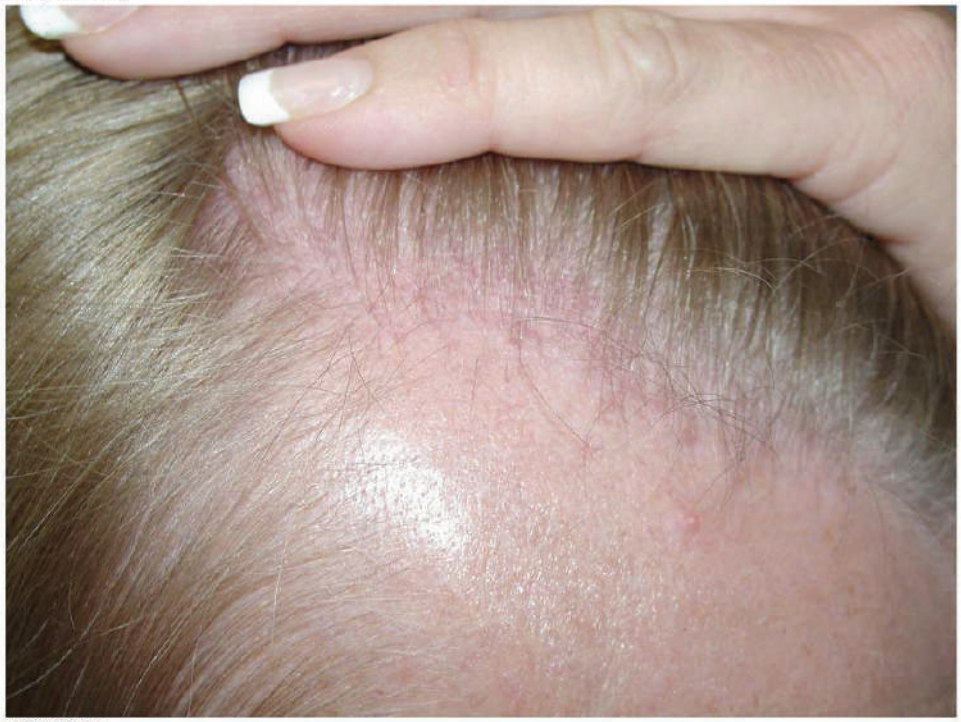
Un-Retouched Before and After Photos from Clinical Studies on Hair Growth- Baseline/26 Weeks







Orlando (01-001)



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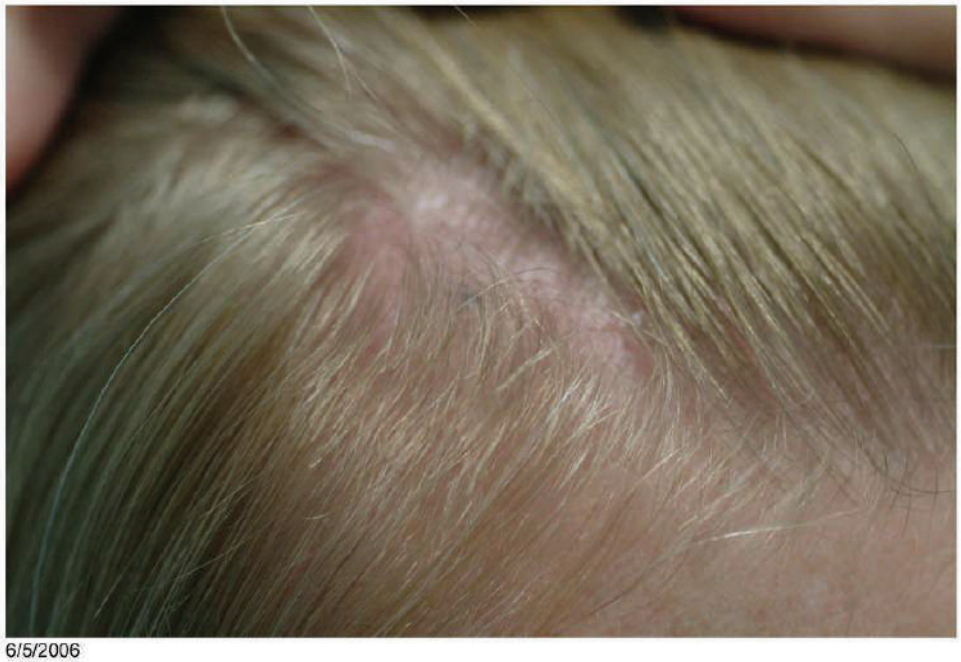

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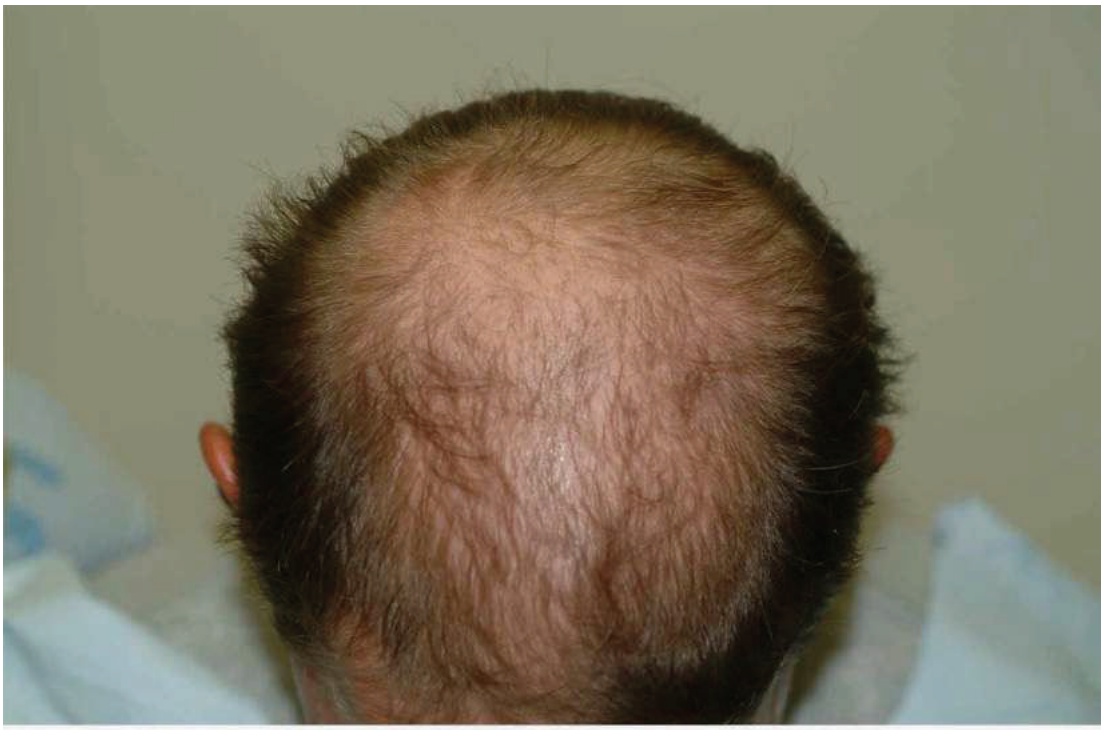

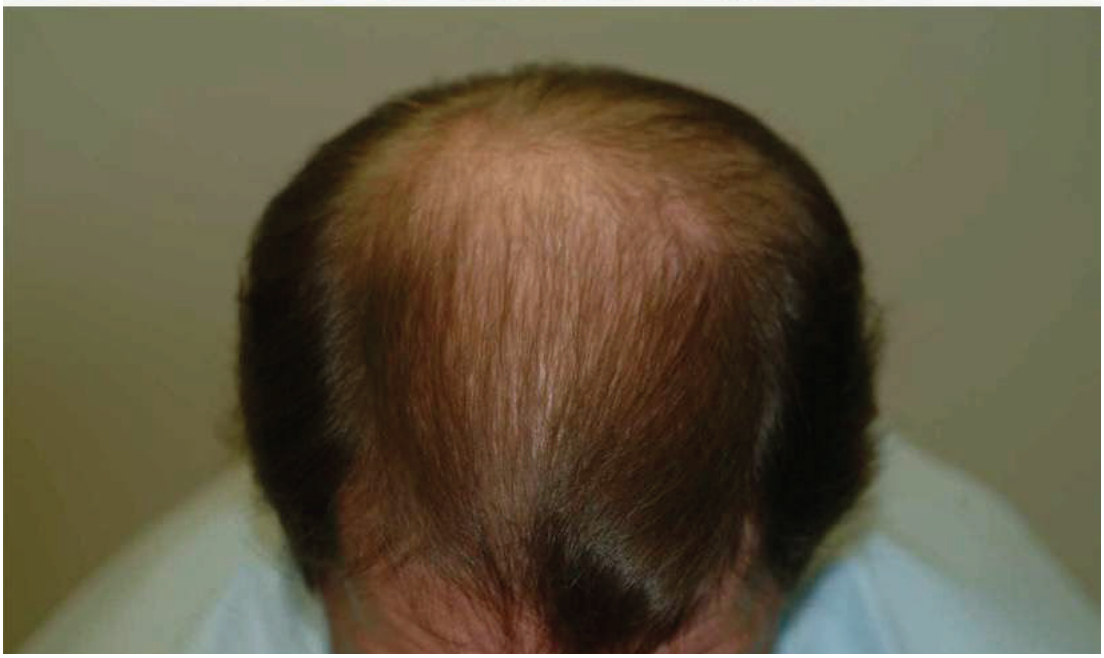

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